

Claims

- 5 1. A valve stem for use with a metering valve, said valve stem comprising an elongate stem element and a sealing element arranged onto the elongate stem element, wherein the sealing element is co-molded with at least a portion of the elongate stem element and the elongate stem element is made of a material comprising a polymer selected from the group consisting of polyaryletherketones, thermotropic liquid crystalline polymers, polymethylpentene, polyphenylene sulfide and mixtures thereof.
- 10 2. A valve stem according to claim 1, wherein the polymer is a polyaryletherketone.
3. A valve stem according to claim 2, wherein the polymer is a polyetheretherketone.
- 15 4. A valve stem according to claim 1, wherein the polymer is a thermotropic liquid crystal polymer.
5. A valve stem according to claim 1, wherein the polymer is a polymethylpentene.
- 20 6. A valve stem according to claim 1, wherein the polymer is a polyphenylene sulfide.
7. A valve stem according to any preceding claim, wherein the sealing element is elastomeric.
- 25 8. A valve stem according to any preceding claim, wherein said material is the first material and the sealing element is made of a second material comprising a thermoset elastomer.
- 30 9. A valve stem according to claim 8, wherein the second material comprises a thermoset elastomer selected from EPDM, nitrile rubber, butyl rubber, chlorobutyl rubber, bromobutyl rubber and neoprene.

10. A valve stem according to claim 8 or 9, wherein the second material comprises EPDM.

11. A valve stem according to claim 8 or 9, wherein the second material comprises nitrile rubber.

12. A valve stem according to claim 8 or 9, wherein the second material comprises butyl rubber.

13. A valve stem according to claim 8 or 9, wherein the second material comprises chlorobutyl rubber.

14. A valve stem according to claim 8 or 9, wherein the second material comprises bromobutyl rubber

15. A valve stem according to claim 8 or 9, wherein the second material comprises neoprene.

16. A valve stem according to any one of claims 1 to 7, wherein said material is the first material and the sealing element is made of a second material comprising a thermoplastic elastomer.

17. A method of manufacturing a valve stem comprising an elongate stem element and a sealing element, said method comprising the steps of:

a) providing a first mold shape;

b) molding a first material comprising a polymer selected from the group consisting of polyaryletherketones, thermotropic liquid crystalline polymers, polymethylpentene, polyphenylene sulfide and mixtures thereof to form the elongate stem element;

c) providing a second mold shape containing at least in part the elongate stem element; and

d) molding a second material to form the sealing element, such that the sealing element is arranged onto and co-molded with at least a portion of the elongate stem element.

5 18. A method of manufacturing a valve stem comprising an elongate stem element and a sealing element, said method comprising the steps of:

a) providing a second mold shape;

b) molding a second material to form the sealing element;

c) providing a first mold shape underlying at least in part the sealing element; and

10 d) molding a first material comprising a polymer selected from the group consisting of polyaryletherketones, thermotropic liquid crystalline polymers, polymethylpentene, polyphenylene sulfide and mixtures thereof to form the elongate stem element having the sealing element arranged onto and co-molded with at least a portion of said elongate stem element.

15 19. A method of manufacturing according to claims 17 or 18, wherein the second material comprises a thermoplastic elastomer.

20 20. A method of manufacturing according to claims 17, wherein the second material comprises a thermosettable elastomer, and the method further comprises an additional step of:

e) curing said second material, said step being performed subsequent to step d).

25 21. A method of manufacturing according to claim 20, wherein the method further comprises an additional step of:

f) removing said second mold shape, said step being performed either prior to or subsequent to step e).

30 22. A method of manufacturing according to claim 18, wherein the second material comprises a thermosettable elastomer, and said method further comprises the additional step of:

e) curing said second material, said step being performed subsequent to step b).

23. A method of manufacturing according to claim 22, wherein the method further comprises the additional step of:

5 f) removing said first mold shape, wherein steps b) to f) are performed in following order: b), e), c), d) and f) or b), c), e), d) and f) or b), c), d), e) and f) or b), c), d), f) and e).

10 24. A method of manufacturing according to claim 21 or 23, wherein the method comprises further comprise the additional step of:

g) thermally treating the sealing element, said step being performed subsequent to both steps e) and f).

15 25. A method of manufacturing according to any one of claims 17 to 24, wherein the step of molding the first material and/or the step of molding the second material is injection molding.

20 26. A metered dose dispensing valve comprising a valve stem according to any one of claims 1 to 16.

25 27. A metered dose dispensing valve according to claim 26, said valve being suitable for dispensing metered volumes of a pressurized aerosol formulation and wherein said valve further comprises a chamber and an outlet passage, wherein the valve stem extends into the chamber and is movable relative to the chamber between non-dispensing and dispensing positions, the valve stem having a configuration including an external surface and the chamber having an internal configuration including an internal surface such that a movable metered volume of pressurized aerosol formulation is capable of being defined therebetween and such that during the movement between its non-dispensing and dispensing positions the valve stem sequentially:

30 i) allows free flow of aerosol formulation into and out of the chamber;

ii) defines a closed metered volume for pressurized aerosol formulation between the external surface of the valve stem and internal surface of the chamber, and
iii) moves with the closed metered volume within the chamber without decreasing the volume of the closed metered volume until the metered volume communicates with the outlet passage thereby allowing dispensing of the metered volume of pressurized aerosol formulation.

28. A metered dose dispensing valve according to claim 27, wherein said valve stem comprises a second sealing element, said second sealing element being arranged onto and co-molded with at least a portion of the elongate stem element and being longitudinally spaced from the first sealing element, each sealing element having a sealing surface capable of forming a gas-tight seal with the internal surface of the chamber.

29. A metered dose dispenser comprising a container equipped with a metered dose dispensing valve according to any one of claims 26 to 28

30. A metered dose dispenser according to claim 29, wherein the container contains a medicinal aerosol formulation.

31. A metered dose dispenser according to claim 30, wherein the medicinal aerosol formulation comprises a medicament and a propellant selected from 1,1,1,2-tetrafluoroethane, 1,1,1,2,3,3,3-heptafluoropropane and a mixture thereof.

32. A metered dose dispenser according to claim 31, wherein the formulation further comprises ethanol.